

## MODIS Clear-Water Epsilon (MOD 39)

### Product Description

This product provides a single parameter, the ratio of clear-water-leaving radiance at 531 nm to that at 667 nm and is called the clear-water epsilon. This quantity relates directly to the iron content of aerosols over clear waters mostly in the  $\pm 35^\circ$  latitude range. The Level 2 product is produced daily, at 1-km spatial resolution, whereas the Level 3 product is produced daily, 8-day weekly, monthly, and yearly, at 4.6 km, 36 km, and  $1^\circ$  resolution.

### Research and Applications

The primary purpose of this algorithm is to estimate aerosol iron content over ocean waters. The aerosol iron influences the validity of other MODIS products. The secondary objective is to flag instances when normalized water-leaving-radiance retrievals may need adjustment due to aerosol absorption at blue and green wavelengths. Such errors will affect chlorophyll *a* calculations. The third objective is to provide a check on the Angstrom exponent derived at red and infrared wavelengths. The algorithm is valid for pigment concentrations up to 2 mg/m<sup>3</sup>. When pigment concentrations are larger than this, the algorithm can no longer be applied. A research algorithm is planned post-launch that will use a coupled ocean-atmosphere radiance model to address, interactively, aerosols in high-pigment water.

### Data Set Evolution

The algorithm is based on methods developed for obtaining clear-water epsilon values from CZCS data. Modifications for the MODIS algorithm include extension of the clear-water concept to include waters with higher pigment concentrations and modification of the values of the normalized water-leaving radiance at 520, 550, and 670 nm for CZCS to the slightly different MODIS bands by means of the water-absorption curve. Product validation will use SeaWiFS data in the pre-launch period and MODIS data post-launch. Scattering and optical-thickness data plus ship data of water-leaving radiances will be acquired to test the clear-water radiance assumptions. This is an interim validation product which may not be archived.

### Suggested Reading

- Carder, K.L. *et al.*, 1991.  
Gordon, H.R., 1978.  
Gordon, H.R., and D.K. Clark, 1981.  
Gordon, H.R., and A.Y. Morel, 1983.  
Gordon, H.R., and M. Wang, 1994.

### MODIS Clear-Water Epsilon Summary

*Coverage:* Global ocean surface, clear-sky only

*Spatial/Temporal Characteristics:* 1 km/daily (Level 2); 4.6 km, 36 km,  $1^\circ$ /daily, 8-day, monthly, yearly (Level 3)

*Key Science Applications:* Aerosol iron estimation, water-leaving radiance correction

*Key Geophysical Parameters:* Clear-water epsilon, aerosol iron content

*Processing Level:* 2, 3

*Product Type:* Validation, at-launch

*Maximum File Size:* 88 MB (Level 2); 865 MB binned, 134 MB mapped (Level 3)

*File Frequency:* 144/day (Daily Level 2); 36/day (Daily Level 3), 36/8-day (8-day Level 3), 36/month (Monthly Level 3), 36/year (Yearly Level 3)

*Primary Data Format:* HDF-EOS

*Browse Available:* 36 km sample imagery available at the Goddard DAAC (Level 3 only)

*Additional Product Information:*  
<http://modis-ocean.gsfc.nasa.gov/dataproduct.html>

*DAAC:* NASA Goddard Space Flight Center

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